3. Background Information

Much of the information provided in this section is summarized from Duke (2001) and BBER (2000 and 2002); additional information was obtained from State of New Mexico and U.S. government web sites (NMEDD, 2002; NMBGMR, 2002; NMEMNRD, 2002; National Park Service, 2002).

3.1 Description of Region

The Jemez y Sangre Water Planning Region, which covers approximately 1,892 square miles, includes most of Santa Fe County, all of Los Alamos County, and a small part of the southern half of Rio Arriba County. Two small portions of Sandoval County are also within the planning region boundaries; these areas were included in the hydrological assessment but have virtually no impact on the regional demographics. The region encompasses the drainage area of the Rio Grande from Embudo on the north to south of Galisteo, between the crest of the Sangre de Cristo Mountains on the east to the Jemez Mountains near Los Alamos (Figure 1).

The area covered by the Jemez y Sangre Water Planning Region is essentially equivalent to the Española and Galisteo structural basins proposed by Baltz (1978), which makes it appropriate for a water planning region from a hydrological point of view. The northern, southern, and eastern boundaries of the region correspond to the boundaries of other regional water plans (Chama, Taos, Pecos, Estancia). The southern two-thirds of the western boundary coincides with the Middle Rio Grande Planning Region.

The region has been divided into ten sub-basins based primarily on surface water flow divides, or in some cases, county lines (Figure 1). Moving in a generally north to south direction these sub-basins are:

- Velarde
- Santa Cruz
- Santa Clara
- Los Alamos

- Pojoaque-Nambe
- Tesuque
- Caja del Rio
- Santa Fe River
- North Galisteo Creek
- South Galisteo Creek

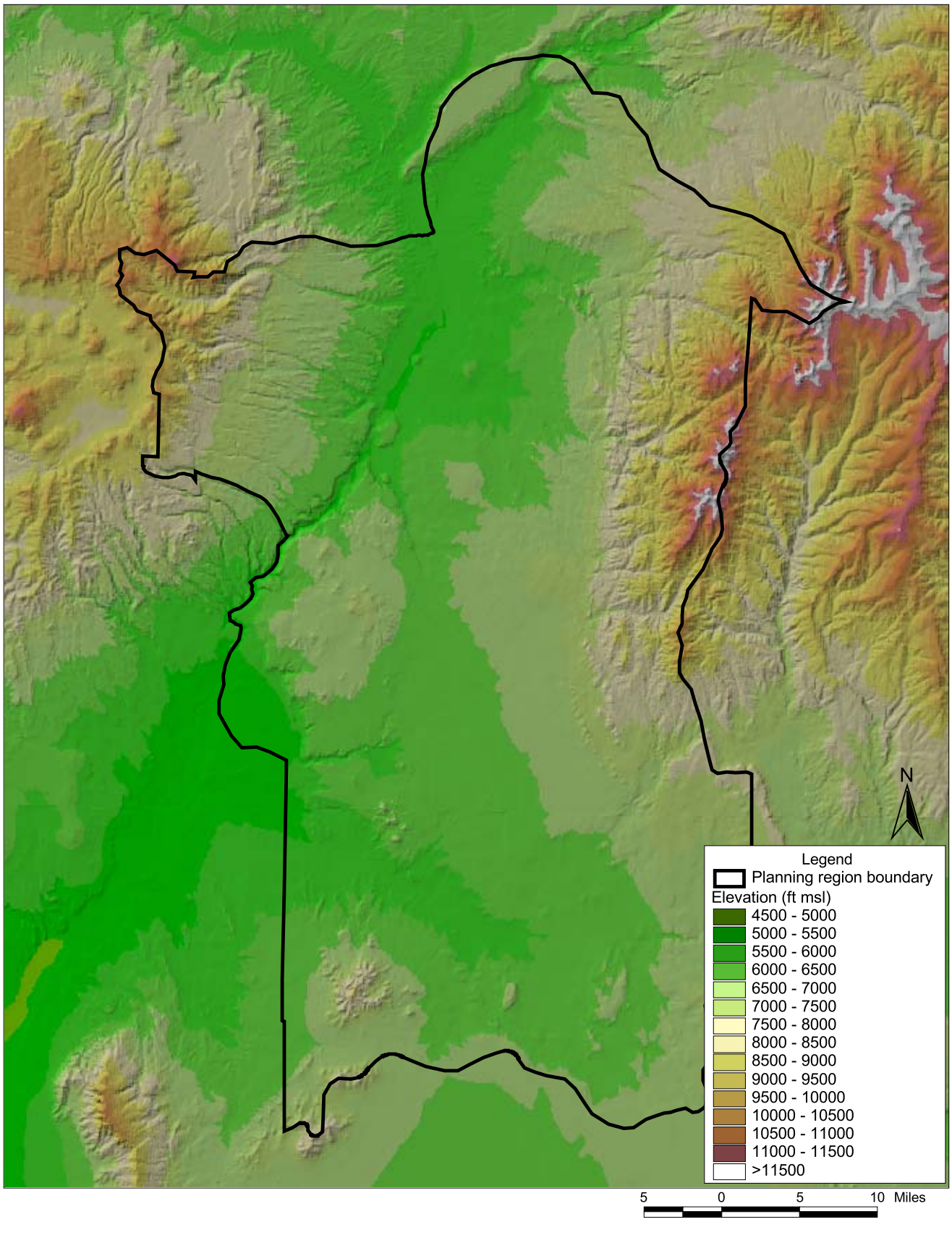
All of the sub-basins contain one or more tributaries of the Rio Grande and are thus hydrologically interrelated. As a result, understanding the relationships among the sub-basins is critical to regional water planning and management. Section 3.3 provides a more detailed discussion of the characteristics of each sub-basin.

3.1.1 Geography and Landscape

Most of the planning region falls within the Española Basin, a geologic structural feature; a small portion of the southern region lies within the northernmost part of the Albuquerque geologic basin. The Rio Grande, which flows through the region in a generally north-south direction, is the main hydrologic feature. It also defines the lowest topographic area of the region, the Rio Grande Valley, which is situated from 5,200 to upwards of 5,700 feet above mean sea level (ft msl) (Figure 2). To the east of the Rio Grande are the high peaks of the Sangre de Cristo Range, some of which exceed 12,500 ft msl. The Jemez Mountains, on the northwest boundary of the planning region, represent another topographic high point, with elevations in excess of 10,000 ft msl.

3.1.2 Climate

Climate in the Jemez y Sangre planning region varies from semiarid to alpine, depending primarily on elevation. Mean annual temperatures at weather stations in the planning region range from 47.9°F (Los Alamos) to 54.3°F (Cochiti Dam). Throughout the planning region, January is typically the coldest month and July the warmest, with mean annual minimum temperatures ranging from 32.2°F (Bandelier National Monument) to 39.9°F (Cochiti Dam), and



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JEMEZ Y SANGRE REGIONAL WATER PLAN

Digital Elevation Model of the Planning Region

Figure 2

mean maximum temperatures ranging from 59.8°F (Los Alamos) to 68.8°F (Española). More detail about regional climate and its influence on water supply is provided in Section 5.1.

3.1.3 Natural Resources

A substantial portion of the mountainous areas of the planning region fall under the jurisdiction of the U.S. Forest Service (Santa Fe National Forest). These areas are used primarily for recreational purposes and timber harvesting, and livestock grazing. They are also prime locations for wildfire. Of 20 communities identified in New Mexico as being vulnerable to wildfire, 3 are in the Jemez y Sangre Water Planning Region and several others are near the boundaries of the region. In addition to the potential loss of property associated with such fires comes the threat of degradation to the watershed through increased erosion and surface runoff.

Bandelier National Monument, which covers approximately 33,000 acres of land in the northwestern part of the planning region, receives approximately 300,000 visitors each year. In addition, 90,000 acres in the nearby Valles Caldera became a national preserve in 2000. The Santa Fe Ski Basin and nearby Hyde Memorial State Park are favorite recreational areas in the Sangre de Cristo Range. Hiking, backpacking, and fishing in the Jemez and Sangre de Cristo Mountains attract many tourists as well as local residents to these areas each year.

The planning region contains several economic mineral deposits, including pumice (Santa Fe and Rio Arriba Counties), mica (Rio Arriba County), sand and gravel (Santa Fe and Rio Arriba Counties), and gold (Ortiz Mountains, Santa Fe County).

3.1.4 Major Surface and Groundwater Resources

The Rio Grande, which drains south through the region from Embudo to Cochiti Reservoir, is the major surface water feature. The Rio Chama, which flows into the Rio Grande near the northwest boundary of the planning region, contributes a significant amount of water to the region. As mentioned, the planning region is divided into ten sub-basins defined primarily on the basis of watershed attributes, although some sub-basin boundaries coincide with county lines. The Santa Clara and Los Alamos Sub-Basins encompass the east slope of the Jemez

Mountains and tributaries in these sub-basins drain east to the Rio Grande. Tributaries in the remaining eight sub-basins drain west from the Sangre de Cristo Mountains (Figure 3), as described in more detail in Section 3.3. The quality of the surface water in the region is generally very good to excellent.

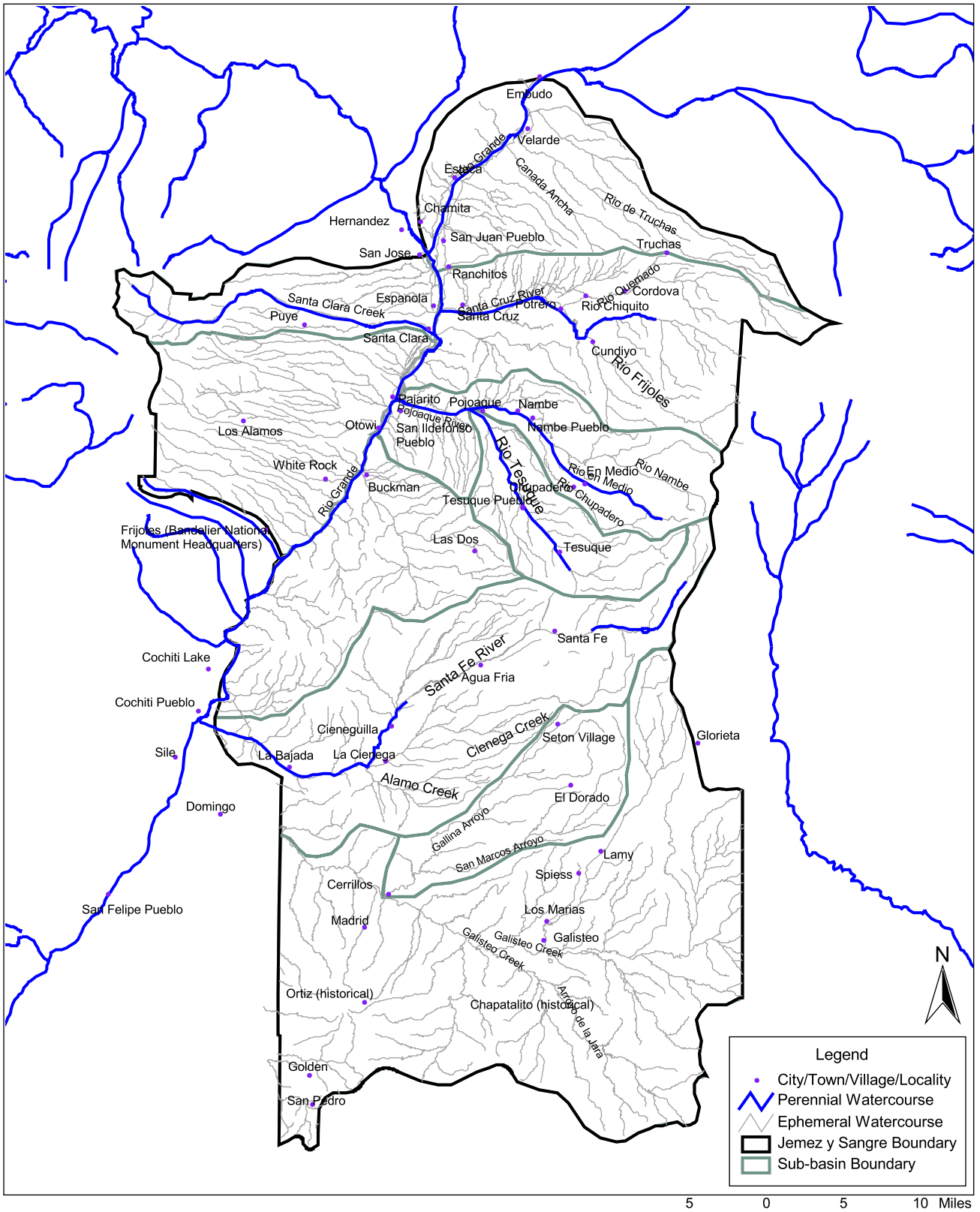
The Tertiary-age Santa Fe Group, which consists of the Tesuque, Ancha, and Puye Formations, is the primary aquifer in nine of the ten sub-basins (Figure 4). In the Rio Grande Valley, the Tesuque Formation has a thickness of more than 9,000 feet. A thin section of the Tesuque Formation supplies shallow wells in the North Galisteo Sub-Basin. The Galisteo Formation is the main water-bearing unit in the South Galisteo Creek Sub-Basin.

3.1.5 Demographics and Economy of the Region

Based on information provided by the BBER (2000), the population of the Jemez y Sangre Water Planning Region nearly doubled between 1970 and 1999. The current population is approximately 160,000, and is projected to reach approximately 360,000 by 2060. The three major employment centers are Santa Fe, Española, and Los Alamos.

Most of the population of the region resides in or near the City of Santa Fe. In 1999 the Santa Fe River Sub-Basin had approximately 86,000 people, or 54 percent of the region's population (Table 4). The Los Alamos and Santa Cruz Sub-Basins are currently the second and third most populous sub-basins, although projections indicate that both North Galisteo and Tesuque Sub-Basins will eventually overtake the slower-growing Los Alamos Sub-Basin. The Caja del Rio, South Galisteo, and Velarde Sub-Basins have the fewest residents and are expected to remain fairly small in population.

Historically (from 1970 to 1998), the population-to-job ratio for the planning region has been in the range of 1.8 to 2.4. Los Alamos and Santa Fe Counties rank first and second in per capita income among the 33 counties of New Mexico, with most employment stemming from the government and services sectors. Tourism is also a major industry for Santa Fe, which boasts several colleges as well as numerous museums, art galleries, and cultural attractions. The economy of Española, the second-largest municipality in the planning area, is based on the



Source: Duke, 2001 (Figure 3-1)

JEMEZ Y SANGRE REGIONAL WATER PLAN

Perennial and Ephemeral Watercourses

Figure 3

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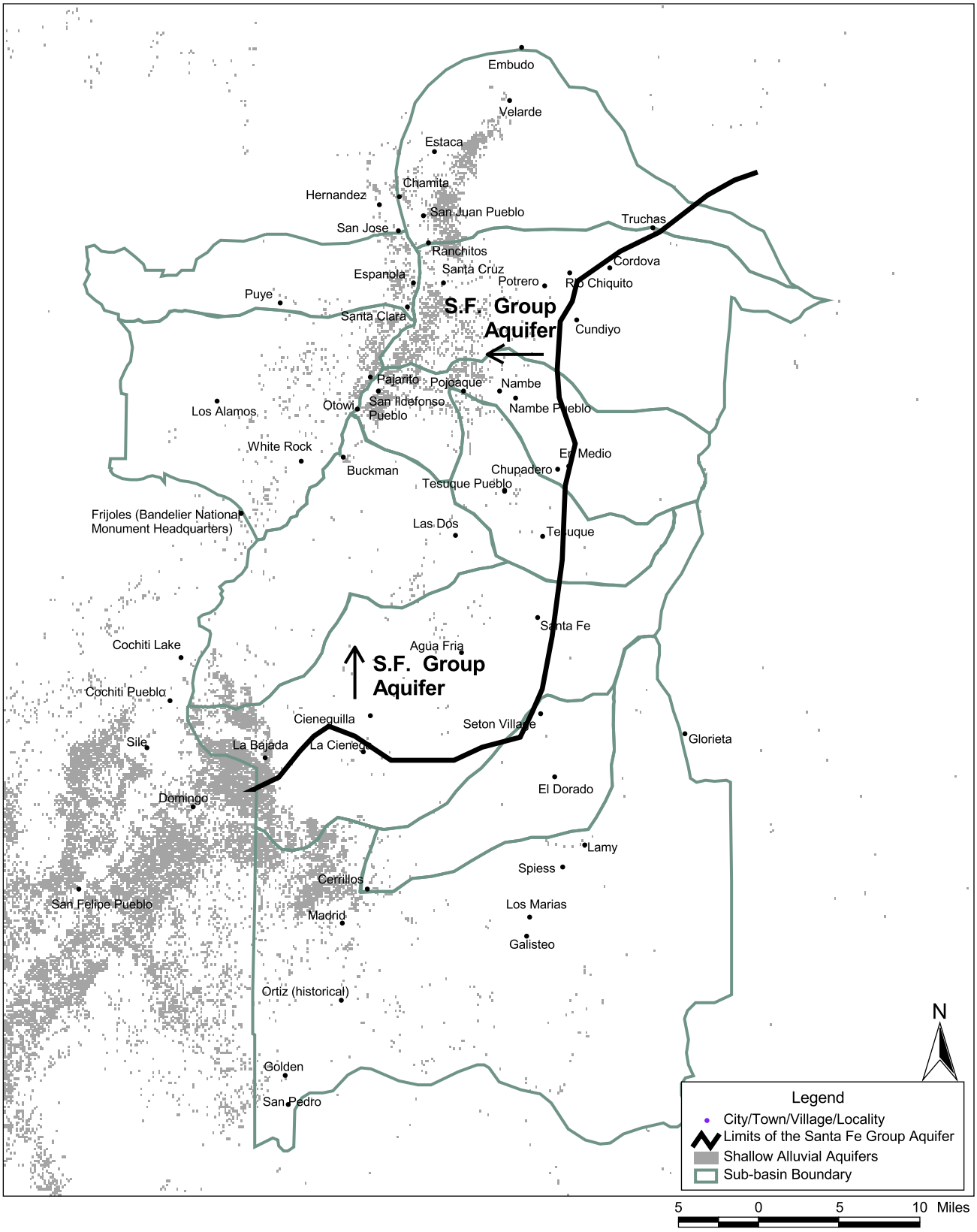

Source: Duke, 2001 (Figure 5-2)

JEMEZ Y SANGRE REGIONAL WATER PLAN

Southern and Eastern Extent of the Santa Fe Group and Distribution of Shallow Alluvial Aquifers

Figure 4

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Table 4. Projected Population and Percentage Distribution in the Planning Region by Sub-Basin

Sub-Basin	July 1 Population Count							
	1990	2000	2010	2020	2030	2040	2050	2060
Velarde	3,671	4,974	5,637	6,313	6,861	7,311	7,729	8,130
Santa Cruz	18,094	20,768	23,713	27,435	31,104	34,788	38,847	43,383
Santa Clara	3,956	3,870	4,380	4,900	5,320	5,664	5,981	6,286
Los Alamos	18,609	19,758	20,509	21,422	22,105	22,573	22,862	23,137
Pojoaque-Nambe	4,794	6,280	7,559	9,580	11,988	14,799	18,229	22,383
Tesuque	3,268	4,859	6,898	9,306	13,818	17,263	23,026	30,422
Caja del Rio	262	554	693	912	1,185	1,518	1,942	2,476
Santa Fe River	71,961	87,709	104,092	118,824	132,404	14,3467	152,250	157,092
North Galisteo	5,834	11,072	13,837	18,208	23,658	30,326	38,785	49,449
South Galisteo	1,665	2,903	3,608	4,970	6,714	8,896	11,700	15,273
All sub-basins	132,115	162,486	190,926	221,870	255,157	286,605	321,171	358,031
Percentage Distribution								
Velarde	2.8	3.1	3.0	2.8	2.7	2.6	2.4	2.3
Santa Cruz	13.7	12.8	12.4	12.4	12.2	12.1	12.1	12.1
Santa Clara	3.0	2.4	2.3	2.2	2.1	2.0	1.9	1.8
Los Alamos	14.1	12.0	10.7	9.7	8.7	7.9	7.1	6.5
Pojoaque-Nambe	3.6	3.9	4.0	4.3	4.7	5.2	5.7	6.3
Tesuque	2.5	3.0	3.6	4.2	5.4	6.0	7.2	8.5
Caja del Rio	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.7
Santa Fe River	54.5	54.0	54.5	53.6	51.9	50.1	47.4	43.9
North Galisteo	4.4	6.8	7.2	8.2	9.3	10.6	12.1	13.8
South Galisteo	1.3	1.8	1.9	2.2	2.6	3.1	3.6	4.3
All sub-basins	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: The 1990 population figures in this table are for July 1, 1990.
Population projections represent "most-likely" scenario (BBER, 2000) with 2002 update.

Sources: BBER, 2000 (Table 2-14)
BBER, 2002

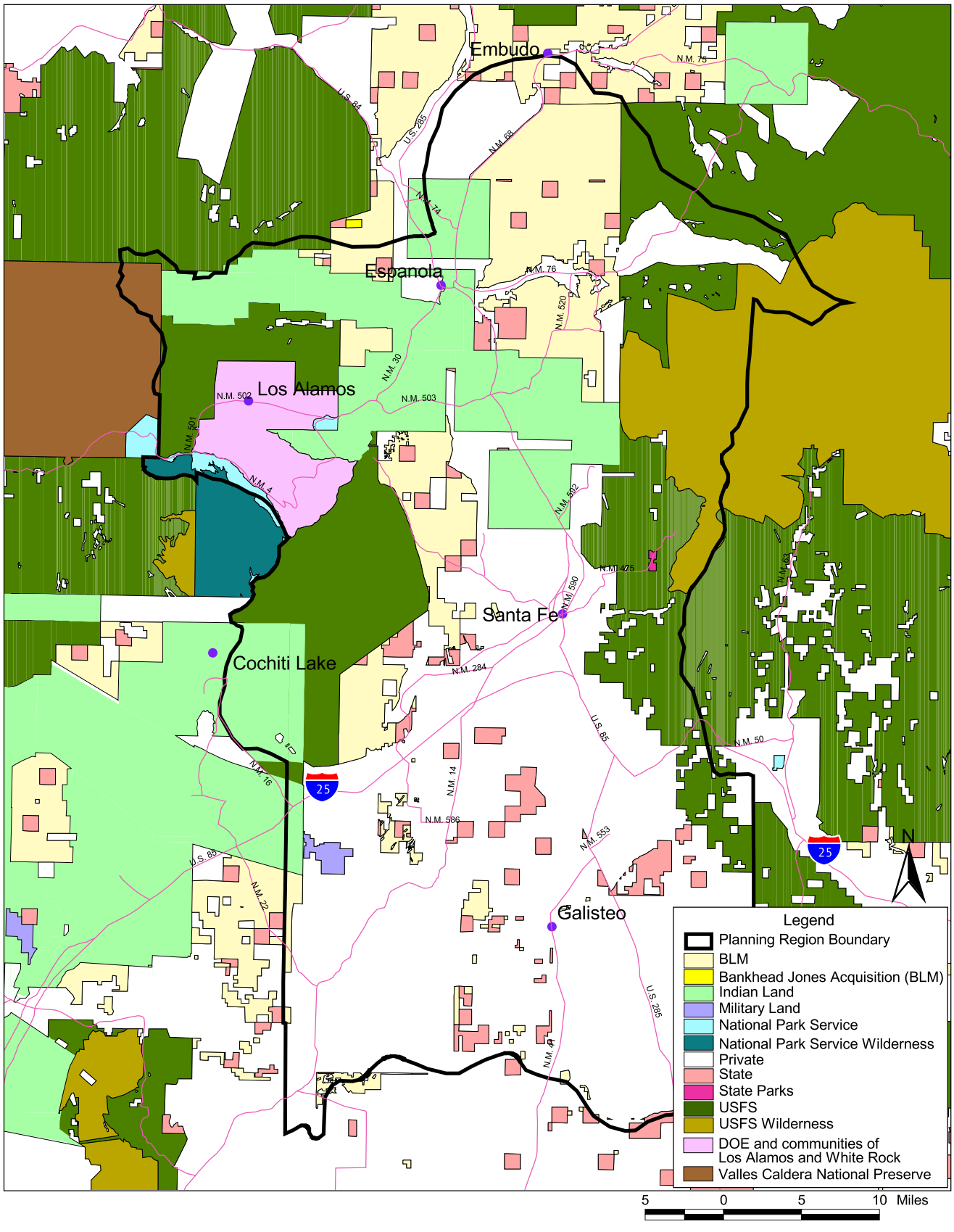
retail, services, and government sectors, with farming and recreational opportunities in the surrounding area. Nearby LANL employs nearly 14,000 people in the Los Alamos Sub-Basin and is the leading economic force in northern New Mexico. In Los Alamos County (all of which falls within the Los Alamos Sub-Basin), 50 to 60 percent of all jobs are with government agencies, while the remaining retail, services, and construction jobs are indirectly linked to the government sector (BBER, 2000).

The economy of much of the rest of the planning region depends on either the nearby municipalities (Santa Fe, Española, Los Alamos, and sometimes, Albuquerque), or on farming, ranching, and the government and services sectors. In the more northern parts of the region such as the Velarde Sub-Basin, government spending in the form of construction projects, transfer payments, and wages, is an important source of personal income (BBER, 2000). During 1997, the average annual net income per farm in Rio Arriba County was approximately $2,000.

3.1.6 Land Ownership and Land Use

The planning region contains a mix of public, private, and Pueblo lands, as well as some state-managed land, three major municipalities, and numerous smaller communities (Figure 5). A substantial portion of the mountainous areas of the planning region falls under the jurisdiction of the U.S. Forest Service (Santa Fe National Forest) and is used primarily for recreational purposes timber harvesting, and grazing. The U.S. Forest Service also has overall responsibility for the recently established Valles Caldera National Preserve, which is managed by the Valles Caldera Trust. The National Park Service manages nearly 33,000 acres of park and wilderness lands in Bandelier National Monument. Within Los Alamos County, the University of California manages LANL, which covers an additional 43 square miles (approximately 27,500 acres) of land.

Major cities and towns of the region include Santa Fe, Española, and Los Alamos, with numerous smaller towns and unincorporated developments throughout the planning region (see individual sub-basins discussions in Section 3.3). Much of the land in the Española Valley is in private ownership and used as small farms.



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JEMEZ Y SANGRE REGIONAL WATER PLAN

Land Ownership/Status

Figure 5

Six Pueblos (Pueblo of Nambe, Pueblo of Pojoaque, Pueblo of San Ildefonso, Pueblo of San Juan, Pueblo of Santa Clara, and Pueblo of Tesuque) are located in the northwestern and west-central portions of the planning region. Portions of two other Pueblos (Pueblo of Cochiti and Pueblo of Santo Domingo) are included in the southwestern border of the region. Altogether, approximately 167,700 acres within in the planning region are designated Pueblo lands.

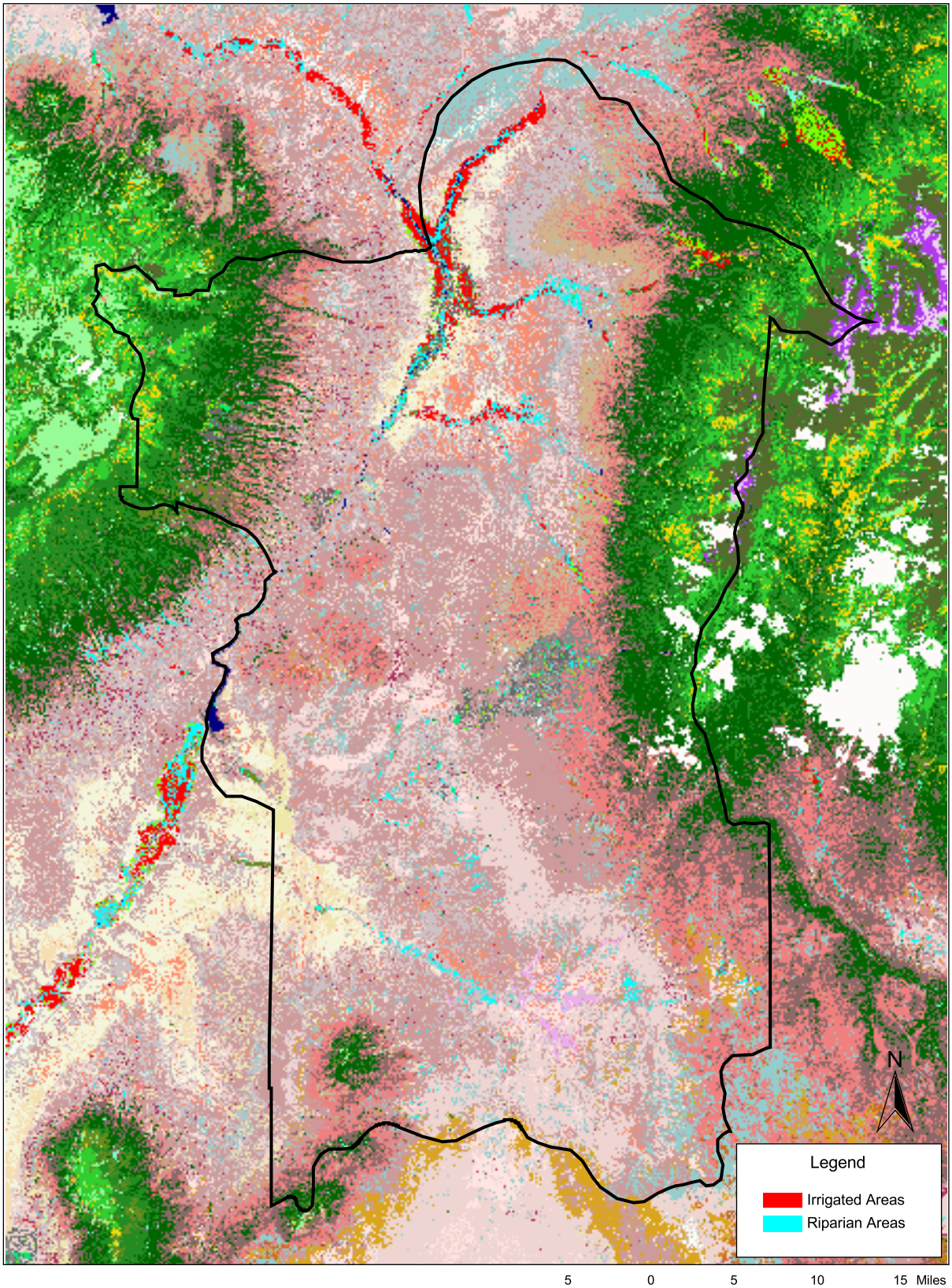
As shown in Figure 6, irrigated lands are found throughout the planning area, especially along major waterways and adjacent to the mountainous areas on the western and eastern edges of the region. Riparian areas are most common along the Rio Grande and its major tributaries in the northern part of the region, around Santa Fe in the central part of the region, and along Galisteo Creek in the southern part of the region.

3.2 Overview of Historical Water Use in the Region

Water use is reported by the OSE for each county in New Mexico every five years. The OSE tracks water use in New Mexico using the following categories:

- Public water supply and self-supplied domestic
- Irrigated agriculture
- Self-supplied livestock
- Self-supplied commercial
- Industrial
- Mining
- Power
- Reservoir evaporation

The majority of the water use in the planning region is for agricultural, public water supply, and self-supplied domestic uses. Irrigated agriculture is the largest use category in the planning region and is responsible for about 70 percent of diverted water. About 25 to 30 percent of the total water used in the planning region is for public water supplies. Domestic use in the region is estimated to be about 7,700 acre-feet per year, and the use of domestic wells is a growing



Source: Duke, 2001 (Figure 3-4)

JEMEZ Y SANGRE REGIONAL WATER PLAN

Land Use/Land Cover in the Planning Region

Figure 6

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sector. Self-supplied livestock, commercial, industrial, mining, and power use categories each make us less than 1 percent of the use in the region. Reservoir evaporation is most significant in the planning region within Santa Fe County, but is less still less than 2 percent of the water use in the County. Detailed information regarding water use in the planning region for each of these categories is provided in Section 6.

3.3 Summary of Sub-Basins' Characteristics

Table 5 provides a summary of the physical characteristics of each of the ten sub-basins in the Jemez y Sangre planning region, which are discussed in more detail below. Summary discussions of water quality and water budget information for the sub-basins are provided in Sections 5 and 6. Duke (2001) provides more detailed characterizations of each sub-basin.

3.3.1 Velarde Sub-Basin

The Velarde Sub-Basin, which covers an area of 167 square miles within the planning region, includes the communities of Alcalde, Estaca, Velarde, and small portions of Española and San Juan Pueblo (Figure 1). Extending from an altitude of 12,300 ft msl at its highest point to 5,572 ft msl at the Rio Grande, the Velarde Sub-Basin encompasses some 6,730 feet of elevation relief. The average elevation of the sub-basin is 6,847 ft msl. The Velarde Sub-Basin receives an average annual precipitation of 12.2 inches.

Most of the sub-basin drains the Sangre de Cristo Range in the vicinity of the Truchas Peaks. A small portion of the sub-basin west of the Rio Grande drains slopes on the east side of Black Mesa, but does not contribute measurable volumes to the local surface water supply. The main streams draining the mountain slope are Rio de Truchas and Cañada de Las Entrañas. Arroyos that drain lower elevations include Arroyo del Pueblo, Arroyo Ocote, Cañada Ancha, Arroyo del Palacio, Arroyo de Los Chavez, Arroyo de Ranchitos, and Arroyo de Los Borregos.

Table 5. Summary of Sub-Basin Physical Attributes

Sub-Basin	Drainage Area (square miles)	Minimum Elevation (ft msl)	Maximum Elevation (ft msl)	Elevation Relief (feet)	Mean Elevation (ft msl)	Main Channel Mean Elevation (ft msl)	Main Channel Slope (feet/mile)	Average Annual Precipitation [a] (inches)	Average Potential Evapo-transpiration [b] (inches/year)
Velarde	167	5,572	12,306	6,734	6,847	6,976	123	12.2	22.1
Santa Cruz	206	5,494	12,982	7,488	7,672	7,108	147	16.3	19.1
Santa Clara	84	5,523	11,525	6,002	7,501	7,316	176	18.3	21.2
Los Alamos	173	5,359	10,423	5,064	7,073	7,047	230	17.8	18.6
Pojoaque-Nambe	123	5,494	12,621	7,127	7,489	7,247	182	16.9	21.1
Tesuque	77	5,753	11,844	6,091	7,272	6,335	91	15.3	21.8
Caja del Rio	158	5,244	7,399	2,155	6,395	6,130	80	12.0	26.0
Santa Fe River	284	5,257	12,136	6,879	6,742	6,332	62	12.4	24.0
North Galisteo Creek	93	5,720	8,229	2,509	6,661	6,258	64	13.0	24.0
South Galisteo Creek	527	5,405	10,512	5,107	6,595	6,086	38	14.0	24.0

Source: Duke, 2001 (Table 3-1)

[a] Average annual precipitation based on spatial weighting of precipitation contours shown in Figure 7 over entire sub-basin.
[b] Average potential evapotranspiration (PET) based on spatial weighting of PET contours shown in Figure 10 over entire sub-basin.

ft msl = Feet above mean sea level

3.3.2 Santa Clara Sub-Basin

The Santa Clara Sub-Basin encompasses 84 square miles on the eastern slopes of the Jemez Mountains north of Los Alamos and southwest of Española. The sub-basin is bounded on the west by the crest of the Jemez Mountains, on the south by the Los Alamos Sub-Basin, on the east by the Rio Grande, and on the north by the drainage divide located north of Santa Clara Canyon (Figure 1). The majority of land in this sub-basin is within the Santa Clara Pueblo reservation boundary in Rio Arriba County.

Santa Clara Creek is the only perennial stream in this sub-basin, but it has several ephemeral tributaries along its reach. The headwaters of Santa Clara Creek are at an elevation of 11,525 ft msl and its discharge at the Rio Grande is at an elevation of 5,523 ft msl, for a total relief of about 6,000 feet. The Santa Clara sub-basin receives an average of 18.2 inches of precipitation annually, mainly from mountain snow and summer monsoon rains.

3.3.3 Santa Cruz Sub-Basin

The Santa Cruz Sub-Basin encompasses just over 200 square miles east of Española, bounded on the west by the Rio Grande, on the north by the Velarde Sub-Basin, on the east by the crest of the Sangre de Cristo Mountains, and on the south by the Pojoaque-Nambe Sub-Basin (Figure 1). Most of the Santa Cruz Sub-Basin is in extreme northeast Santa Fe County and southeast Rio Arriba County. The sub-basin drains the western flanks of the Sangre de Cristo range between Pecos Baldy on the south and Truchas Peaks on the north. The elevation ranges from 12,980 ft msl in the Sangre de Cristo range to 5,490 ft msl at the Rio Grande, a relief of 7,490 feet from east to west. The main stream draining the sub-basin is the Santa Cruz River and its principal tributaries are the Rio Quemado, Rio Medio, and Rio Frijoles. Other significant drainages within the lower elevation areas of the sub-basin flow only after major storm events and include Arroyo Seco, Arroyo Madrid, and Arroyo de la Mesilla.

3.3.4 Los Alamos Sub-Basin

The Los Alamos Sub-Basin, which encompasses Los Alamos County and small portions of Rio Arriba and Santa Fe counties, consists of the relatively high mountains and deeply cut plateaus of the Jemez Mountains. Portions of Santa Clara Pueblo and San Ildefonso Pueblo occupy the eastern part of the sub-basin with the Rio Grande forming the eastern boundary (Figure 1). Most sub-basin residents live in Los Alamos or White Rock. Landholdings are largely federal, including Los Alamos National Laboratory.

The watersheds within the sub-basin encompass a total area of approximately 173 square miles. The sub-basin extends from a high elevation of 10,423 ft msl in the Jemez Mountains to about 5,360 ft msl at the Rio Grande where the southernmost tributary (Rito de los Frijoles) joins the main stem river; thus the total elevation relief is about 5,060 feet. Rather than comprising a single, main watershed with a distinct outlet, the Los Alamos Sub-Basin is characterized by several canyons that drain southeastward to eastward and are directly tributary to the Rio Grande. They include Guaje Canyon, Los Alamos Canyon, Pajarito Canyon, Water Canyon, Ancho Canyon, and Canyon de los Frijoles. Several other smaller canyons are tributary to these major canyons. Almost all streams within this sub-basin are considered ephemeral or intermittent.

3.3.5 Pojoaque-Nambe Sub-Basin

The Pojoaque-Nambe Sub-Basin drains an area of 123 square miles in the northern portion of Santa Fe County. The elevation ranges from 12,621 ft msl at the peaks of the Sangre de Cristo Range to 5,494 ft msl at the Rio Grande, for a total relief of over 7,000 feet. The Nambe, Pojoaque, and San Ildefonso Pueblos are located within the sub-basin boundaries and occupy most of its land area, while the Santa Fe National Forest covers its eastern area (BBER, 2000). The closest long-term precipitation station to the sub-basin is Santa Fe. Average precipitation is 13.84 inches but has varied from 5.03 inches to 21.75 inches.

The main streams in the watershed are the Nambe River, the Rio En Medio, Chupadero and the Tesuque, all of which combine to form the Pojoaque River. The Nambe River is the principal

stream in the watershed and has the only surface water reservoir in the watershed. The normal reservoir storage capacity is 2,023 acre-feet.

3.3.6 Tesuque Sub-Basin

The Tesuque Sub-Basin is located north of Santa Fe with headwaters in the Sangre de Cristo Range south of Lake Peak (Figure 1). The Tesuque Sub-Basin watershed encompasses 77 square miles and ranges from 11,850 ft msl on the east to 5,750 ft msl at the confluence of the Rio Tesuque and Pojoaque Creek, for a total relief of 6,100 feet across the sub-basin. Precipitation averages 15.3 inches per year, most of which results from winter snow, and brief but intense summer thunderstorms. Higher elevations receive significantly more precipitation than the lower areas along the Rio Tesuque.

The eastern portion of the sub-basin consists mostly of Santa Fe National Forest land, the central portion is Tesuque Pueblo land, and the northwestern area includes parts of the Nambe and Pojoaque Pueblos. Within the sub-basin, Tesuque and Little Tesuque Creeks flow generally west from the Sangre de Cristo Range, converging to form the north-northwest flowing Rio Tesuque. The Rio Tesuque eventually joins Pojoaque Creek to form the Pojoaque River, which in turn flows west to the Rio Grande.

3.3.7 Caja del Rio Sub-Basin

The Caja del Rio Sub-Basin is situated in the western part of Santa Fe County and includes a portion of San Ildefonso Pueblo (Figure 1). The Rio Grande forms the western boundary of the sub-basin. The Caja del Rio Sub-Basin, located between the combined Tesuque and Pojoaque-Nambe watershed on the north and the Santa Fe River Sub-Basin on the south, has a combined drainage area of about 158 square miles.

Elevations in this sub-basin vary from 7,400 ft msl at the highest point to about 5,150 ft msl feet at the Rio Grande near the sub-basin's south boundary. The Caja del Rio Sub-Basin receives an annual average precipitation of 12 inches. The Caja del Rio Sub-Basin has several watercourses and arroyos that originate within it and are directly tributary to the Rio Grande.

Two additional drainages occurring in the northern half of the sub-basin are defined respectively by Thirty-one Draw and Arroyo Eighteen. Drainages in the southern half include Santa Cruz Arroyo, Arroyo Tetilla, and Arroyo Colorado, the latter two of which combine to form Canada de Cochiti, a tributary to the Rio Grande. The only available surface water records show some spring flows close to the Rio Grande.

3.3.8 Santa Fe River Sub-Basin

The Santa Fe River Sub-Basin, which drains the southern extent of the Sangre de Cristo Range and covers a total area of 284 square miles, contains the largest municipality within the region, the City of Santa Fe (Figure 1). The sub-basin has a total elevation relief of 6,900 feet, extending from 12,150 ft msl down to 5,250 ft msl at the Rio Grande. Average annual precipitation in the Santa Fe River Sub-Basin is 12.4 inches, with a minimum recorded precipitation of 5.03 inches and a maximum of 21.75 inches during the period 1868-1996.

The Santa Fe River is the most significant surface water resource within the sub-basin. Major tributaries to the Santa Fe River include Arroyo Hondo, Arroyo Calabasas, Cienega Creek, and Alamo Creek. The Santa Fe River is perennial from Santa Fe Lake at 11,700 ft msl to Nichols Reservoir and from the City wastewater treatment plant (southwest of Santa Fe) to Cochiti Lake. The natural outlet for the Santa Fe River is at the Rio Grande about 2 miles south of Cochiti Lake, but the river's discharges are diverted northward to the lake about 3 miles upstream of the natural outlet.

3.3.9 North Galisteo Sub-Basin

The North Galisteo Creek Sub-Basin lies immediately south of the Santa Fe River Sub-Basin (Figure 1). The sub-basin has a drainage area of 93 square miles and an elevation relief of 2,510 feet, with land elevations ranging from 8,230 to 5,720 ft msl. The watershed receives an average annual precipitation of about 13 inches. The community of Cerrillos is located in the western tip of the sub-basin, while Eldorado, Eldorado at Santa Fe, Seton Village, Cañada de los Alamos, and San Sebastian are situated progressively to the east. Galisteo Creek does not actually flow within the sub-basin; however the drainages in the North Galisteo Creek Sub-Basin

eventually empty into Galisteo Creek to the south. The main stream within this sub-basin is the southwest-trending Gallina Arroyo, formed by the merging of Cañada de las Minas and Cañada Ancha in the foothills near the southern extent of the Sangre de Cristo Range. San Marcus Arroyo joins Gallina Arroyo about two miles upstream of the watershed's outlet at Galisteo Creek.

3.3.10 South Galisteo Sub-Basin

The South Galisteo Creek watershed is the largest of the planning region's sub-basins, encompassing about 527 square miles. The Ortiz Mountains form part of the watershed's south boundary, while part of the eastern boundary of the defined sub-basin is formed by the eastern boundary of Santa Fe County and the entire western boundary of the sub-basin coincides with the border between Santa Fe and Sandoval Counties (Figure 1). The South Galisteo Creek Sub-Basin varies in elevation from 10,500 ft msl in the Sangre de Cristo Mountains to about 5,400 ft msl at the western Santa Fe County line. Lamy, Galisteo, Golden, and Madrid are the major communities in the sub-basin, which also contains an unpopulated portion of the Santa Domingo Pueblo land.

In upper portions of the watershed, Apache Canyon River and Galisteo Creek combine to drain about 32 square miles of the southern end of the Sangre de Cristo Mountains. For the initial 15 miles below the confluence of these two streams, Galisteo Creek flows toward the southwest. West of Galisteo, the creek flows west-northwest until it joins the Rio Grande about 5 miles west of the Santa Fe County/Sandoval County line. Tributaries to Galisteo Creek include Cañada Estacada, Arroyo de la Jara, Gavisco Arroyo, Cunningham Creek, and Arroyo Charro. Some geologic units in the sub-basin form an aquifer, but generally these are thin, entirely bounded laterally by low permeability rocks that receive little recharge. Thus, on a regional scale, they are not considered to be significant water-bearing units.